

**DRAINAGE SYSTEM AND REFUSE DISPOSAL IN
MAITUMBI, CHANCHAGA LGA, NIGER STATE**

BY

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PGD/GEO/2001/2002/240**

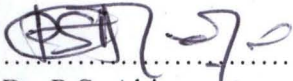
**DEPARTMENT OF GEOGRAPHY
SCHOOL OF SCIENCE AND SCIENCE EDUCATION**

BEING A RESEARCH PROJECT SUBMITTED TO THE
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
IN PARTIAL FULFILMENT FOR THE AWARD OF
POST-GRADUATE DIPLOMA (PGD) IN
ENVIRONMENTAL MANAGEMENT 2001/2002

OCTOBER, 2003

CERTIFICATION

This project work has been read and approved as meeting the partial requirement for the award of Postgraduate Diploma (PGD) in Environmental Management of the Federal University of Technology, Minna, Niger State.


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DEDICATION

This Project work is dedicated to Almighty Allah and my beloved Father.

ACKNOWLEDGEMENT

My appreciation and profound gratitude go to Almighty Allah for His protection over me throughout my stay in the University. Alhamdulillah!

I am very grateful to my parent, (Mr. & Mrs. Otaru) for encouraging me to go to school and also for their financial and moral support during the period of my study.

I am highly indebted to my Project Supervisor, Dr. P.S. Akinyeye for his advice, encouragement and assistance during the course of this project.

I am also grateful to all members of staff both academic and non-academic of the Department of Geography for their contributions towards the successful completion of this programme.

I record my sincere appreciation to my parents, brothers, sisters, husband and friends for their moral support.

I will never forget my co-workers and close associates who have always been praying for me as I moved from one place to the other in Minna. To all the people mentioned above, I pray that Allah will reward you accordingly.

Finally, my Lord, my Patron, my Protector, my Director, my enricher, I say Alhamdulillah, Rabil-alami for guiding me to the right path of righteousness and seeing me through my stay at the University.

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ABSTRACT

The poor state of drainage system and refuse disposal in Nigeria has become the most pressing issue in recent times. As a result, efforts have been made to improve the qualities of the environment. This sad situation has been brought by storm water which accelerates the deterioration and destruction of roads pavements and the entire environment. In view of this, there is need for good drainage system which serves as one of the basic needs of our environment.

The purpose of this study is to highlight the effect of bad drainage system in Ibitumbi settlement with a view to suggest possible solutions that will remedy the problems within this broad aim, the specific objectives as:

- a. To examine the concept of drainage system and
- b. To examine the existing drainage channels in the study area.

The study used various methods to carryout the research. Such methods include the use of percentage (%), Questionnaires etc.

The study revealed that the most common drainage system is the local ones, which are mostly constructed, by various landlords and that the dumping sites within the study areas were hygienically in miserable states.

CHAPTER ONE

1.1 INTRODUCTION

Most of the developing countries particularly African countries have made great effort in recent years to improve the qualities of their environment. In most cases however, pavement drainage performance still leaves a lot to be desired. It has not been sufficient enough to preserve the quality of the environment in a desired condition.

Engineers, planners and environmentalists have known that storm water accelerates the deterioration and destruction of roads pavements and the entire environment and they have expressed the view that good drainage system is one of the basic needs of our pavement for effective and efficient service. History has shown that delay in the provision of drainage where necessary entails not only expensive reconstruction and rehabilitation but can adversely caused erosion and retards development (Arnold, 1974).

Providing urban drainage channel is an important aspect of urban planning because of its attendant consequences. In Nigeria, flooding and erosion are two drainage problems that are rampant. After heavy rainfall, many roads, residential and non-residential compounds, open spaces are usually flooded as a result of poor drainage facilities.

Furthermore, it does not only block roads but also damage household properties and severe cases loss of lives. Huge quantities of sand are normally deposited on roads causing damages to the asphalt used in road construction, which usually weakens and disintegrates when subjected to prolonged period of floodwater. It is these destructive

elements of rainwater and storm water caused by inadequate and sometimes lack of drainage that triggered of the study.

Erosion is so severe that the roadways have been worn away and reduced making movement of vehicles difficult. Another aspect of urban erosional problem is the erosion pavement of houses and the foundations. This has led to the collapse of fences, some measures to control erosion by urban residents includes dumping of huge sacks of sand in erosion areas and gully heads. Another method is making of basket like structures to aid deposition of sand (George, 1941).

To effectively treat the issue of drainage problems and effects in many parts of the world, there is the need to know what it entails, its fundamental basis as well as the principles guiding its planning, provision and maintenance. Many professionals accordance to their respective professions have defined the term drainage. One of such agricultural professionals was Arnold (1974) defined change "as the removal of excess water from the land into a natural channel or into other land".

The term drainage can also be defined as a channel by which liquid is drained or gradually carried off. It can be an artificial conduit or channel for carrying off excess water or removal of water by graying implying either a flow down a slope or percolation.

Arnold (1974) also said "drainage is required to carry excess water off the land into a natural channel or artificial channel. In large areas of land, the drainage channels often form a network of ditches into which the surplus water seeps from the surrounding soil. The channel must be made progressively deeper to provide a gradient otherwise the water will not flow and it will not be effective. In low-lying region, the channel may drain into a stagnant lake or artificial swamp from which the water can periodically be

pumped to allow drainage to continue. These channels may be open ditches to an adequate depth with sloping sides and sufficient gradient to permit the water to flow or they may be covered pipes that is closed conduit usually concrete but sometimes plastics into which the excess water can seep and be carried off. This therefore emphasizes the significant of width, depth and gradient in the provision of drainage channels for the achievement of efficiency. Drainage can be divided into surface and sub-surface drainage.

Surface drainage involves the removal of water from the top soil. It could also be said that, it is the removal of water from whether rain or melting snow that falls directly on the roadbed and interception and the removal of water coming to the road from houses and adjacent terrains. This is usually done on soil where sub soil water movement is very slow, while sub-surface drainage involves the removal of water from beneath the soil surface. It involves the removal of water from the sub-surface and with the interception of underground water coming to the sub-surface. This is accomplished by the use of pipe drains through which the water is removed to a safe distance from the area.

There are various reasons for the removal of excess water from the surface; some of these are:

- a. To prevent water logging:- Water logged soils are usually deficient in oxygen and are usually not advisable for development.
- b. It helps in preventing an area from flooding, which always destroy lives and properties.
- c. It also helps in controlling the salinity of the soil especially areas where salt water is common.

The process of drainage channel implies the ways of draining water in an urban area. This is mostly concerned with the techniques of draining water in an urban area and the types of drainage channels to suit the type of soil in urban area especially the study area. The common types are:

Urban Drainage: Man has shown his creative and innovative mind through his design and construction of cities which stand as monuments to his imagination, similarly his powerful intellect has enable him evolve solution to the problems facing cities today. One of the problems commonly found in the cities is the flow of storm water through channels/drainages to receiving water causes. Considerable amount of budgets and time are devoted to the safe conveyance of this water either through sewerage system or in channels and these led to the construction of drainage's of various capacity and discharge.

The third (3rd) National Development Plan (1975-80) noted that storm water drainage system has not changed for decades, inspite of the call to include drain channels in road construction. It also noted that many of the urban centers lack integrated drainage network. The commonly found drainage systems consist mainly of open earth or roads. This trenches are often generally too narrow and too shallow to drain the water from the cities efficiently during heavy rains. Consequently, many streets become flooded and un-motorable. Physical structures such as buildings are also affected in one way or the other. This is the situation in Maitumbi town where only few drainage channels have been provided inspite of the high population of people and increasing rate of impervious surfaces due to housing construction.

1.2 STATEMENT OF PROBLEM

The presence of stagnant water in some parts of the study area is due to the inadequate number of drainage channels. The inadequacy of the existing number of the drainage channels in the study area has led to the presence of stagnant waters; places in the satellite towns are usually water logged during the rainy season. In some cases, wastewaters from homes are often directed to the main road.

Poor maintenance of the existing number of the drainage channels, despite the fact that the drainage channels are inadequate, the existing ones are poorly maintained.. Poor construction method of the drainage channels due to lack of adherence to engineering specification by contractors usually disintegrates when subjected to prolonged period of floodwater. It is these destructive elements of rainwater and storm water caused by inadequate and sometimes lack of drainage that triggered of the study.

1.3 AIMS AND OBJECTIVES

The aim is to examine the effect of bad drainage system in Maitumbi settlement with a view to suggesting solutions that will remedy the problems within this broad aim, the specific objectives are:-

- To examine the concept of drainage system in the study area
- To examine the existing drainage channels in Maitumbi settlement
- To suggest physical planning solutions to the problems identified.

1.4 JUSTIFICATION

Maitumbi is an area that has relatively high population density. A large percentage of the land is used for development. There is a lot of impervious surfaces with very few drainage channels available. These drainage channels are used for refuse

disposal, thereby blocking the channels. Therefore whenever there is rainfall, the water from the impervious surfaces cannot drain into the natural drainage. The result in flash flooding which covers the roads and causes damage to properties and there is always the presence of stagnant water everywhere in the study area. Even during the dry season, water from sewers does not have free passage and the result is water stagnation, which often affects the general well being of the people. Therefore this study is to proffer solution to the effect of bad drainage system on Matumbi environment.

1.5 SCOPE AND LIMITATION

The scope of this study is limited to Maitumbi environment. Random sampling will be adopted in the distribution of the questionnaire. The study will concentrate on the problems associated with the poor drainage system in the study area. Time constraint will affect the comprehensiveness of the study.

CHAPTER TWO

2.0 BACKGROUND INFORMATION OF THE STUDY AREA

Settlement, particularly urban slum or illegal settlement (Unplanned Environment) tend to display certain internal form such as the degree of connectivity of their dwellings and this overall shape. The form of any urban slum settlement is a reflection of the population, socio-economic background, landform, drainage, climate conditions, geology (topographical) and cultural environment in which it has developed. Thus these forms of settlement may be compact, with closely space dwellings due to scarcity of land.

2.1 POPULATION

The world's traditional framers are conservatives and their life style is difficult to change. The Kasamojong in Udanda, Masai of Tazania and Nigeria's Gwari and Nupe share a contempt for farming and other stationary occupations (IUCN, 1988).

However, for the over 10,000 residents (Census NPC, 1991) of Maitumbi made up of the Yoruba, Hausa, Igbo, Gwari, igala, Nupe, Fulani, etc. Minna metropolis is a growing Capital of Niger State, with an estimated population of about 143,896 (NUDB).

2.2 LOCATION OF THE STUDY AREA

The study area lies within Latitude 9°32' to 9°41'N and Longitude 6°30' to 36°E. it covers area of about 195km², accessible through minor and major roads.

Minna metropolis covers so many wards, e.g. Bosso, Maikunkele, Chanchaga, Maitumbi, Kpakungu, Paida, Sauka Kahuta, Saiko, Kongila, Keteren Gwari, Dutsen Kura etc.

2.3 CLIMATE

Minna lies within the middle belt of Nigeria, with sub-humid type of climate classified as the tropical wet and dry by Koppen (1971). Share two seasons are very dependent on the two prevailing air masses over the country at different times of the year, the dry tropical continental air mass of originating from the Atlantic ocean.

The two air masses, nearly opposite in direction met a zone of discontinuity stretching east west across West Africa known as the inter-tropical discontinuity (ITD). It migrates northward, and southwards, following the earth revolution. It reaches the southern limit at a latitude 5°N in January, and its northern limit in the variety of Latitude 20°-24°N in August. The (ITD) as explained above reaches the study are Latitude 9°35'N between March and April at it recedes in October.

2.3.1 Temperature

The highest temperature is usually recorded in April at 31°C and the lowest in August 25°C.

Table 2.1 below shows that temperature varies with months and years. The highest peak of April, 31°C clearly shows the period of highest air pollution through evaporation in the indisposed dump sites and distraction of the adjoining soil and microbe in the environs.

Table 2.1: Temperature of the Study Area (°C) for 1996-1998

FIGURES IN (°C) MONTHS													
YEARS	J	F	M	A	M	J	J	A	S	O	N	D	MEAN
1996	27.7	30.3	31.6	31.3	28.1	26.0	25.3	24.7	25.5	25.9	23.3	26.7	27.4
1997	28.2	28.4	31.0	29.8	27.5	26.6	25.8	21.3	26.2	26.8	27.2	26.9	27.1
1998	27.4	31.2	32.3	32.4	29.0	27.1	26.1	25.4	25.4	26.0	27.8	28.0	28.3

2.3.2 Rainfall

Generally, rain begins in April and the highest amount occurs from June to September with August as the peak. The length of rains was on varies from 7 months in 1996 and 1998 to 8 months in 1997. the winter or dry season commences as from November to March, with no amount of rainfall received over the period under study.

Table 2.2: The monthly rainfall total for 1996-1998 figure in (mm)

YEARS	J	F	M	A	M	J	J	A	S	O	N	D	MEAN
1996	0	0	0	48.6	164.5	225.0	.	257.0	191.1	127.4	0	0	1274.0
1997	0	0	0	3.6	80.6	223.0	.	172.4	192.7	203.3	115.0	0	1245.1
1998	0	0	0	8.25	121.0	155.1	.	243.0	201.9	212.6	0	0	1237.3

From the table above, there is going to be highest run off in August, thus the surface water contamination will be at the highest rate and also groundwater pollution during the period.

2.4 LANDUSE

One of the major factors, which contribute to the overall quality of the physical environment of any locality within an urban area, is the allocation of land to various land use types. The land use pattern in Maitumbi indicates that residential and shopping complexes constituted over 80% of the total developed land. This reflects that virtually all available space in Maitumbi is devoted to residential land use. The density of residential dwellings is higher as no space is left between individual building for sewers and drainage channels. This shows that the proportion of land devoted to residential area is excessive when it is realized that ideally only about 50 percent to 60 percent of the developed land in high density residential area of Nigeria cities should be devoted to residential dwellings. Another serious defect of the land use structure in the area is the

small amount of land devoted to transport that is roads and streets. Ideally, high-density residential area to which Maitumbi belong should devote between 15 to 20 percent of land area to streets and roads or for circulation.

One implication of the almost complete allocation of developed land in the study area is the high population density per hectare. The population density range from 1,000 persons to 1,500 persons per hectare. The high densities therefore constitute serious constraints on the available drainage system provided and the maintenance of an acceptable standard of environmental sanitation in these areas.

Agricultural activities in Maitumbi are on the high side, as most of the land in the out sketch is devoted to farming. Within the metropolis, arable farming is on small scale, because most of the lands have been devoted to residential dwelling. There are a few cattle, but the animals always go uphill for grazing, although the available land is used for both arable farming and grazing.

2.5 LAND FORM

The area covered by this study is of low topography relief without highland or hills. The highest points are the western part of Chanchaga with hills of about 250m above sea level and about 60-70m above the country rocks. It has typical guinea-savannah vegetation composed of shrubs, few short tree species, with grasses between the height 1.5-3.5m. The trees have average height of about 16m. Major occupation of the people is farming and cattle rearing.

2.6 SOILS

The majority of the soils in the Maitumbi have developed from the crystalline rocks of the basement complex. The soils owe their general form to the physical and chemical constituents of the weathered rocks.

However, local factors such as topography, vegetation type and microclimate conditions determine the site specific morphology of the soil. The soils are generally well drained except in valley bottoms. Congregational layers occur most frequently and are formed as ferruginized weathered parent materials. The soils of the plains and hill consist of alluvial complex soil. Generally, the soils of the territory especially those coinciding largely with hilly and rugged landscapes are more sandy than the surrounding soils and are as noted by Ehotiyon Associates (1996) better earmarked for nature protection and outdoor recreation.

2.7 VEGETATION

Savanna woodland are found primarily in hilly terrain such as ridges tops and hill clusters. The trees are found with limited foliage and a ground vegetation dominated by grasses, shrub vegetation is frequently found below high wooded ridge or on low interfluves and therefore of common occurrence. Expectedly, shrubs dominate this type of vegetation with scattered trees.

CHAPTER THREE

3.0 METHODOLOGY

The method of investigation in this project work will be through the use of prepared questionnaires, which will be distributed among the population of the study area. All the responses received for the questionnaires will form the basis of the data. Apart from the questionnaire, the ground truth assessment of the study area will add to the information required by the project work.

3.1 SOURCE OF THE DATA

Data are collected from the responses received from people who filled and returned their questionnaire forms and the ground truth assessment made of various places within the study area.

Information was also obtained from library, various textbooks and personal discussions from individuals. Newspapers and other information media were also used as source of data collection.

3.3 POPULATION AND SAMPLING

The questionnaires were distributed to people living in Maitumbi and its environs using random sampling of the population. The scattered population were chosen because closer information needs to be received on the situation of waste management in majority of the study area.

3.4 DATA ANALYSIS

The data collected were analyzed through the use of percentage and tables. The data from the questionnaires were tabulated. These data were then used for various discussion of the results.

CHAPTER FOUR

4.1 DISCUSSION OF RESULTS

A total of 96 questionnaires were sent out to respondents and 74 completed questionnaires were returned, representing 77% of the total number of questionnaires sent out. The responses are as follows:

Question 1: Which of the following drainage system are more nearer to your house?

Table 4.1: Drainage system nearer to the house

Response	Frequency	Percentage
Pipe drainage	19	25.6
Mole drainage	20	27.0
Local drainage	35	47.2
Total	74	100

Source: Compiled by the Author

Of all the drainage system in the study area, local channel constituted the largest. This channel contains mostly waste from pure water, sobo drinks and other commodities sold in polythene bags. The local channel constitutes about 47% of the total drainage system. This is followed by mole drainage system which are more refine and can only be found in restricted areas. These are the areas that are averagely planned.

Question 2: How do you handle household wastes?

Table 4.2: Household wastes

Response	Frequency	Percentage
By throwing them anywhere	64	86.4
By storing them in dustbins	10	13.6
Total	74	100

Source: Compiled by the Author

Wastes generated from the study are largely thrown away into nearby drainage system instead of being stored before removal. About 86.4% of the total wastes generated are simply thrown away into drainage/channel. The table also indicates that the use of dustbins is not in practice. Only 13.6% of the respondents store their waste before they are collected for disposal. These are mostly the enlightened people that occupy bungalows or flats with modern system of waste disposal.

Question 3: How regular are wastes removed from dumping sites?

Table 4.3: Removal of Wastes from dumping sites

Response	Frequency	Percentage
Immediately wastes are dumped	01	1.3
Not removed at all	10	13.5
Removed after several weeks	63	85.2
Total	74	100

Source: Compiled by the Author

Table 4.3 above indicates that the bulk of the wastes dumped at the various dumping sites or local channel within the study area are abandoned for several weeks without removal. About 85.2% respondents indicated that wastes are abandoned at the

dumping sites/local channel for a long time before removal. This indicates that the wastes sometimes block the effective passage of water. This could cause flooding or water, which could lead to damage of properties.

Question 4: When do you observe wastes increases in Maitumbi

Table 4.4: Observance of wastes increases in Maitumbi

Response	Frequency	Percentage
Rainy season	57	77
Dry season	17	23
Total	74	100

Source: Compiled by the Author

Of the whole waste generated within the study area, 77% is in the rainy season.

This may be due to the additional agricultural wastes that are abundant during the period.

There is only 23% increase in wastes generation during the dry season.

Question 5: People do not use dustbin but prefer local drainage due to the following:

Table 4.5: Non-usage of dustbin

Response	Frequency	Percentage
Poverty	27	36.5
Ignorance	14	18.9
Not provided by government	33	44.6
Total	74	100

Source: Compiled by the Author

Majority of people in the study area constituting about 44.6% or respondents have indicated that people do not use dustbin but prefer to dump their wastes into local drainage because the government did not provide them. This is followed by 36.5% of the respondents who attribute the lack of usage of dustbin as a result of poverty. The remaining 18.9% of the respondents attribute the reason to ignorance. It implies that they are not aware of the damages that can be caused through the blockage of these drainage systems.

Question 6: People can assist in proper channel system management by:

Table 4.6: Proper channel system management

Response	Frequency	Percentage
Community effort	25	33.7
Government to employ labour for cleaning waste from the channel/drainage	49	66.3
Total	74	100

Source: Compiled by the Author

About 66.3% of the respondents have shown that government should employ labour (direct involvement of government) as the best way to help in channel/drainage management. About 33.7% of the respondents however indicate that community effort is the best way to deal with the local drainage/channel management. This indicates that majority of people will prefer intervention provided by the government.

Question 7: How can the government improve waste and local channel/drainage management?

Table 4.7: Improvement on waste and local channel/drainage management

Response	Frequency	Percentage
Early removal of wastes from channel/ drainage system	62	83.7
Increasing public awareness	12	16.3
Total	74	100

Source: Compiled by the Author

Table 4.7 above shows that about 83.7% of the respondents in the study area have indicated that government can improve the waste and local channel/drainage management by quick removal of solid wastes from the channel and its environment. This has also shown the level of disturbance heaps of refuse in and around the drainage system to the people in the study areas. The 16.3% response means that people do not see public awareness as important as immediate removal of wastes from within and around the drainage system.

Question 8: Which is the best way to dispose off solid wastes?

Table 4.8: Best way to dispose off solid wastes

Response	Frequency	Percentage
The use of channels/drainage	00	0.0
Burning	10	13.5
Dumping into the bush	41	55.4
Dumping within the town	23	31.1
Total	74	100

Source: Compiled by the Author

About 55% of the respondents in Table 4.8 above have indicated that dumping the solid wastes inside the bush is the best way to dispose off solid wastes. This is an indication that more people are aware of the dangers of having large heaps of wastes around them. About 31% of the respondents have shown that dumping within town is still the way to improve solid waste disposal while the remaining 13.5% of the respondents are in support of burning the wastes. It is to be noted that non of the respondents are in support of dumping waste in drainage channels, this implies that majority are aware of the danger of erosion and flood.

Question 9: Which of the following hazards is more disturbing, if drainage channel are blocked with solid wastes?

Table 4.9: Hazards caused by channels blockage

Response	Frequency	Percentage
Damage of properties	13	17.8
Offensive odours	25	33.6
Flooding of the environment	36	48.6
Total	74	100

Source: Compiled by the Author

In Table 4.9, 48.6% of the respondents believed that flooding of the environment is more injurious. This could lead to inaccessible road and make movement very difficult. This is because every household near flooded channel is uncomfortable due to the muddy and wet ground. 37.6% of the respondents are of the view that offensive smell from the dumping sites is more disturbing when wastes are mixed with flooded water. While only

17.6% of the respondents have pointed to damage of properties to be the most disturbing hazard of channel blockage.

Question 10: Which of the following is a more disturbing effect of smoke nuisance?

Table 4.10: Disturbing Effect of Smoke Nuisance

Response	Frequency	Percentage
Reduced visibility	12	16.3
Breathing difficulty	14	18.9
Eye irritation	48	64.8
Total	74	100

Source: Compiled by the Author

The largest number of respondents constituting 64.8% sees eye irritation to be the most disturbing effects of smoke nuisance from dumping sites. Breathing difficulty comes next with 18.9% of the respondents in support while reduced visibility comes last as the most disturbing effect of smoke nuisance and supported by 16.3% of the respondents.

Question 11: Which of the following acts causes the blockage of drainage?

Table 4.11: Causes of channels blockage

Response	Frequency	Percentage
Solid wastes falling into drainage from dumping sites	09	12.1
Wind blowing wastes into drainage	19	25.6
People directly dumping wastes into drainage	46	62.3
Total	74	100

Source: Compiled by the Author

A total of 62.3% of the respondents in Table 4.11 believed that drainage in Maitumbi are blocked by refuse directly thrown into them by the people while 25.6% believed that the wastes in drainage are blown in by the agent of wind. Only 12.1% of respondents see the blockage to be due to direct falling of wastes into the drainage from dumping sites thereby resulting in blockage.

Question 12: Which of the following may happen due to the blockage of the drainage?

Table 4.12: Results of channels blockage

Response	Frequency	Percentage
Offensive odours	24	32.4
Flooding of surrounding areas	50	66.6
Total	74	100

Source: Compiled by the Author

Out of 74 respondents in Table 4.12, 50 people representing 66.6% considered the effect of the blockage to drainage to be flooding of the surrounding areas while the remaining 24 people representing 32.4% see offensive smell to be what is likely happen due to drainage blockage.

4.2 GROUND ASSESSMENT

On the ground assessment, the study indicated that the whole environment had scattered presence of one type of solid waste or the other. There were however limited quantities of wastes in the streets due to the handwork of the Minna Environmental Protection Board who are always seen sweeping the streets, particularly the main street that runs through Maitumbi and Main market.

The solid wastes dumping sites are located in some strategic locations in Maitumbi and its environment. Most of the dumping sites have grown into heaps of solid wastes and are very close to the drainage channels. The height of the wastes kept on growing because of non-collection of wastes as soon as they are dumped. It is possible to have some parts of the wastes that have been dumped for several weeks without collection.

The composition of the wastes is largely polythene bags. Some have been dumped for several months while some are freshly dumped. Apart from the polythene bags, raw and cooked food wastes were also noticed in large quantities. There was also little scattered presence of metal and rubber wastes around the channels drainage system.

Most of the channels/drainage systems visited were in a terrible state of offensive smell emanating from the rotten garbage and other rotten materials. This is as a result of the mixture between wastewater and rotten garbage. The solid wastes from all the dumping sites that are close to drainage channels are threatening to or have completely blocked the drainage of runoff from rainwater across the channels. Where the dumping sites are close enough to drainage systems the wastes are seen falling inside the drainage system.

Some wastes are also set on fire because of irregular collection. The fire produces huge smoke nuisance that spread over a wide area surrounding the dumping site. Animals like goats, chicken, dogs etc. are seen mouth-probing into the wastes looking for some food. These animals contribute in scattering the wastes all over the dumping sites. Looking along the modern drainage system in Maitumbi, there are areas that are blocked by the solid wastes.

4.2.1 Health Related Hazard: Environmental degradation may also result from poor storm water management in the urban centers. It is a known fact that many areas that are not well drained serves as suitable grounds for breeding of diseases carrying pathogens. Some of the present drainage channels are menace to public health and welfare (Jackson et al, 1966). The act apart from polluting the air, contribute in the spread of various water borne diseases such as typhoid, gastreutorites, amebiasias, arsenic poisoning such as fouled water can gain passage to public tap through broken water pipes in drains. Where cleaning of drainage channels are attempted, no provision is made for the disposal of the solid waste from the cleared area. The wastes removed from the drainage channel are pitted up by roadsides, which eventually end up again in the same channel. The stagnation of water and the decomposition of debris, result in the production of highly undesirable and offensive odour, which can be hazardous to the health of the populace.

Planning of urban drainage channels is an important aspect of planning of an urban area like Maitumbi, because of its attendant problems that are rampant after heavy rainfall. Many roads, residential and non-residential compounds or open spaces are usually flooded. It does not only block roads, but also damage houses and properties worth million of Naira. Huge quantities of sands are normally deposition on roads causing damages to the asphalt used in road construction, which usually weaken and disintegrates the road when subjected to prolonged period of floodwater. Drainage has been one of the pressing problems in urban areas.

Urban drainage problem is a phenomenon, which has got the attention of many environmentalists and government. As Lazarus (1978) said, it is generally accepted that the trend towards more intensive urbanization, which existed in the United States and in

nearly, all other nations will continue through the remaining parts of the countries. The hydrology of urban areas is quite complex. This is evident in our urban centers where problems are on the increase with increasing urbanization. The demand for better study of the growing magnitude of urban drainage problems and the inability of traditional method of dealing with the problems needs to increase.

CHAPTER FIVE

5.0 FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 FINDINGS

The outcome of the data analysis and the general assessment of the study area have shown that the most common drainage system is the local ones which are mostly constructed by various landlords. This construction terminates at the end of their house building. The facts that industrial growth is still low within the study area, industrial wastes are not yet a disturbing phenomenon. It is however disturbing those dustbins whether household or community based and the wastes are subsequently collected and disposed off solid wastes will not have littered everywhere as it is now. This would have minimized the blockage of channels. Apart from the reason given in Table 4.5, which is non-provision of dustbins, by government, the issue of poverty is also strongly part of the cause of non-usage of dustbins by the people. Thus they resulted in dumping their wastes in local channels/drainage system.

The dumping sites within the study area were hygienically in miserable states. In fact, the dumping sites are eyesores. Wastes are continuously dumped but are not regularly collected. It is even difficult for people who come to dump their refuse to reach the central point of dumping so the refuse is deposited anywhere near the dumping site. In most cases, however, wastes are dump in channels so that the force of the water/rain can carry the waste elsewhere. When the rain stops the dumped wastes are left in the bed of the channel and eventually the wastes will block the channel, which result into flood.

Apart from the unsightly nature of these dumping sites there is also the problem of offensive smell from the rotten materials concealed in the heaps of wastes. The smell

Even increases during intensive heat when decomposition rate heightens. The smell makes life seriously uncomfortable for the inhabitants of the areas near dumping sites. Furthermore, domestic wastes water and rainwater causes offensive smell when they mix with solid wastes.

Most pedestrian paths close to the dumping sites are completely blocked. People who normally should pass through the blocked road paths are forced to take alternative route. The drainage systems close to the sites are also threatened with blockage. The closeness of some dumping sites to the drainage system may result in some wastes falling inside the drainage system but people also throw wastes directly (see Table 4.10) into the drainage system.

A very disturbing phenomenon in connection to the dumping sites is the smoke nuisance. Most of the dumping sites are always on fire producing clouds of smoke nuisance into the atmosphere. Apart from the effects of this smoke in climate change it makes the whole environment uncomfortable for living. The smoke causes eye turbances (Table 4.10), which may lead to more serious eye problems if exposure continues.

Ground-truthing reveals that domestic animals are always found around the dumping sites and drainage channel. Since the life of these animals are related in one way or the other to the life of human beings there is the fear of disease transmission from one animal to man. Animals like goats can get poisoned from dumping sites and die. When a goat is unknowingly eaten it may have some effects on man. Rats are known to

transmit disease known as plague to man. The continuous access to dumping sites and drainage channel by rats therefore poses some danger to man.

Drainage that is constructed to enhance water flow may result in flooding. Several parts of the drainage system are gradually growing weeds whose growth is encouraged by the fertility of the wastes washed into the drainage or deposited into them. If this situation persists in the next few years there may be flooding which may result into loss of properties and sometimes loss of lives.

The irregular collection of wastes and immediate clearance of channels is no doubt contributing to the hopeless situation of the areas. There is clearly no presence of legislation that checks the activities and conducts of people towards the environmental protection. What the community uses as environmental sanitation laws are a set of laws that are decades old and can no longer stand the test of time and circumstances. The public health edict in existence is a product of Military Government of 1984. The edict is inadequate to be able to address the present environmental complexities and its punitive provisions are watery. Human beings no matter how mindful about environmental purity should have a set of laws by their side as a reminder.

5.2 CONCLUSION

It clearly appears that the council and Minna Environmental Protection Board have not done enough in terms of the provision of effective and adequate manpower and equipment to deal with the issue of solid wastes and poor drainage/channel system management. The people on their own part appear to be either ignorant of or socially disabled to provide dustbins for use. This turns every available space of land a potential dumping site.

Finally, the absence of effective and comprehensive legislation against acts that promote environmental degradation is a contributive factor in the filthy state of environment in Maitumbi.

5.3 RECOMMENDATION

The existence of dumping sites in the study area is not acceptable and should be stopped. All wastes collected should be taken to the bush far away from the town and dumped. This becomes necessary as an interim measure because there is no local technology that will reduce the wastes into some useful materials and all the other methods of disposal earlier discussed will not be able to cope with the volumes of refuse generated. The wastes, after a long time can be used by farmers as manure. As for the polythene bags, it is impossible to stop their usage and they do not decay like other types of wastes. In the absence of a technology that will reprocess them, they have to be taken outside the town like other types of solid wastes.

For the above recommendation to be reasonable there should be the provision of dustbins of smaller size for households to store all the refuse generated. A better and well protected channel should be constructed. Bigger size dustbins should be provided at particular locations to serve a number of household. This should be accompanied by the provision of adequate and effective manpower and equipment that will collect the wastes from various points at regular intervals. The government or the solid waste management agency can charge some fees from people who use the dustbins. This will go a long way in supplementing the cost of wastes management. This will also avoid the local channel or drainage system from being used as dumping sites for solid wastes.

A strong public awareness campaign regarding the dangers of depositing wastes everywhere and the advantages of using dustbins should be established and every measure taken to keep it alive for as long as necessary.

Finally, a set of legislation should be promulgated to check the activities and conducts of the people towards maintaining a clean environment. The legislation should be strong enough to deal with anyone, no matter his social position, who contravenes any of the environmental protection law.

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